

WE CLAIM:

1. A guidewire apparatus comprising:  
an elongate hollow shaft;  
a core wire slidably disposed within the hollow shaft and having a distal end extending there from;  
a tubular protection element disposed about a distal region of the core wire and having a distal end coupled about the core wire distal end and a proximal end coupled about the hollow shaft, wherein initially separating the ends of the protection element effectuates transformation of the protection element from a deployed configuration to a collapsed configuration and wherein farther separating the ends of the protection element creates curvature therein, the curvature simultaneously inducing a corresponding angular deflection in the underlying core wire distal region.
2. The guidewire apparatus of claim 1 wherein the farther separating of the ends of the protection element requires increasing an axial tension applied thereto.
3. The guidewire apparatus of claim 1 wherein the tubular protection element is a filter.
4. The guidewire apparatus of claim 1 wherein the tubular protection element is an occluder.
5. The guidewire apparatus of claim 1 wherein the tubular protection element comprises braided filaments.

6. The guidewire apparatus of claim 1 wherein the proximal and distal ends of the tubular protection element are coupled rotatably to the hollow shaft and core wire, respectively.
7. The guidewire apparatus of claim 1 wherein the tubular protection element comprises an elongate region having a modulus of elasticity less than the composite modulus of elasticity of the remainder of the tubular protection element outside the elongate region.
8. The guidewire apparatus of claim 6 wherein, when axial stress is applied uniformly to the ends of the tubular protection element, the elongate region yields before the remainder of the tubular protection element outside the elongate region.
9. The guidewire apparatus of claim 1 wherein the separating of the ends of the protection element is caused by translating the core wire distally with respect to the hollow shaft.
10. The guidewire apparatus of claim 8 wherein distally translating the core wire generates axial compression therein.
11. The guidewire apparatus of claim 1 wherein an angle of deflection of the core wire distal region is in the range of 0-90 degrees from a longitudinal axis of the guidewire.
12. The guidewire apparatus of claim 11 wherein the angle of deflection of the core wire distal region is in the range of 0-35 degrees from a longitudinal axis of the guidewire.

13. A steerable guidewire apparatus comprising:
- an elongate hollow shaft;
  - a core wire slidably disposed within the hollow shaft and having a distal end extending there from;
  - a tubular protection element disposed about a distal region of the core wire having a distal end coupled about the core wire distal end and a proximal end coupled about the hollow shaft;
  - a first configuration having the tubular protection element radially expanded about the core wire;
  - a second configuration having the tubular protection element radially collapsed about the core wire; and
  - a third configuration having corresponding curvature in both the tubular protection element and the core wire of the second configuration.
14. The guidewire apparatus of claim 13 wherein the tubular protection element is symmetrically collapsed about the core wire in the second configuration.
15. The guidewire apparatus of claim 13 wherein the second configuration has axial tension in the protection element and axial compression in the core wire.
16. The guidewire apparatus of claim 13, further comprising a liner interfitted between the core wire and the hollow shaft, the liner having inner and outer surfaces, wherein at least one of the surfaces has a low coefficient of friction.
17. The guidewire apparatus of claim 13, further comprising a transition sleeve slidably disposed about a distal portion of the hollow shaft and extending over the core wire distal end.

18. The guidewire apparatus of claim 17 wherein the coupling of the tubular protection element distal end about the core wire distal end comprises the tubular protection element distal end being affixed to the transition sleeve, which is rotatably coupled to the core wire distal end.

19. A method of steering a distal protection guidewire apparatus through a patient's tortuous vessel comprising:

- providing a guidewire apparatus having a hollow shaft, a core wire slidably disposed there through, and a tubular protection element disposed about a distal region of the apparatus;

- translating the core wire distally with respect to the hollow shaft to collapse the tubular protection element about the distal region of the apparatus;

- introducing the guidewire apparatus into the patient's vessel;

- translating the core wire distally with respect to the hollow shaft to deflect the collapsed tubular protection element and the distal region of the apparatus; and

- negotiating the guidewire apparatus through the patient's tortuous vessels by rotating and advancing the deflected distal end of the apparatus.

20. The method of steering a distal protection guidewire apparatus according to claim 19, further comprising:

- translating the core wire proximally with respect to the hollow shaft to straightening the collapsed tubular protection element and the distal region of the apparatus.

21. The method of steering a distal protection guidewire apparatus according to claim 19, further comprising:

translating the core wire proximally with respect to the hollow shaft to deploy the tubular protection element into apposition with an interior site of the patient's vessel.

22. The method of steering a distal protection guidewire apparatus according to claim 19 wherein translating the core wire distally with respect to the hollow shaft comprises:

applying axial tension to the tubular protection element; and  
applying axial compression to the core wire.

23. The method of steering a distal protection guidewire apparatus according to claim 19 wherein the tubular protection element is a filter.

24. The method of steering a distal protection guidewire apparatus according to claim 19 wherein the tubular protection element is an occluder.